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TERRORISM

How vulnerable are chemical plants?
Page 7

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News of the Week

■ **Nobel prizes in chemistry and medicine honor U.S. research work in crystallography and cholesterol metabolism** **Page 4**

■ **Monsanto offers early retirement incentives to more than 10% of its salaried U.S. workforce.** **Page 5**

■ **EPA proposes concentration rules for eight volatile organic chemicals in drinking water.** **Page 6**

■ **Record high in particle reaction energies reached in Fermilab's first proton-antiproton collisions in its new facilities.** **Page 6**

Business

Producers hope enactment of proposed trade bill will curb decline in U.S. output of polyester, nylon, and acrylic fibers. **Page 15**

Government

Department of Transportation issues tougher safety standards for vehicles carrying poisonous volatile liquids. **Page 20**

Technology

Two new processes for phosphoric acid production offer prospects for significantly reduced manufacturing costs. **Page 23**

Package system for recovery of poly (ethylene terephthalate) from plastic bottles touted in Western Europe. **Page 25**

Contract proposals for synthesis of inorganic/organic compounds sought by National Cancer Institute. **Page 27**

Books

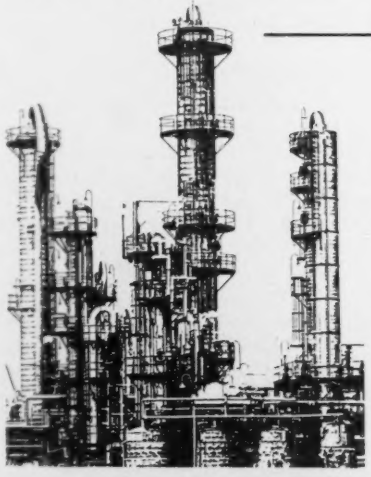
"Controlling the Atom" by George T. Mazuzan and J. Samuel Walker gets to the roots of nuclear regulation. **Page 28**

ACS News

Official reports from Chicago meeting reflect committee activism and concern on many matters. **Page 33**

Awards

ACS award winners: Kenaga, Lee, Lewis, Marzocchi, Montgomery, Morawetz, Novotny, Patrusky, and Perkins. **Page 39**



News Focus

Chemical and oil industries have not been exempt from terrorist attacks; expert on terrorism and security affairs Neil Livingstone offers advice on corporate security. **Page 7**

Letters 2

Concentrates
Business 14
Government 19
Science/Technology 22

The Departments
Newscripts 56

Hurting Synthetic Fiber Producers Look for New Curbs on Imports

Enactment of proposed textile trade bill to reduce imports of apparel could stem decline in U.S. output of polyester, nylon, and acrylic fibers

Bruce F. Greek, C&EN Houston

New legislation soon could curb the rising tide of imported apparel and other textile products, which continues to dampen U.S. production of polyester, nylon, and acrylic fibers. The proposed textile trade bill aims to reduce the rapid growth in apparel imports from several Asian countries. Whether this bill or other restrictions will succeed in restoring growth to U.S. synthetic fiber production remains to be seen.

Early in October, the bill was passed by the House and is now awaiting action by the Senate. Enactment of the bill, which might include passage over a Presidential veto, would further limit imports from such countries as China, Hong Kong, Japan, South Korea, and Taiwan. In its present form, the bill would not limit imports from Canada or various West European countries.

Even if the textile trade bill becomes law soon, its effects will be a while coming. Thus the impact on 1986 production of acrylic, nylon, and polyester fibers could be rather small. Output next year could be above 1985 production, which is expected to total some 6.3 billion lb, accounting for most of the noncellulosic synthetic fiber production in the U.S. This production will be down about 3% from 1984.

Key Polymers

Forecasts for production of these fibers in 1986 are tempered by two factors: potential restriction of imports by the textile trade bill and general economic conditions during the year. If, for example, a significant recession begins in 1986, then fiber production would be affected more by the economic downturn than by lower imports. Although no growth in imports of apparel, or even a small decline in such imports, would ease the effect of any recession that might occur, fiber production still could slip, according to one industry observer.

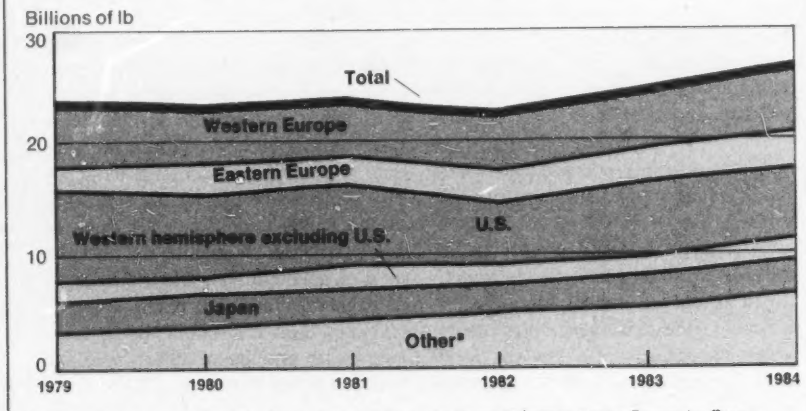
If imports of apparel and other textile products grow slowly after 1985, fiber production then would be influenced by growth in demand for the products. Although fashion can have an impressive impact on fiber demand, the total volume is so large that fashion doesn't really change production much in a year's time. Therefore, growth in fiber production for the rest of the 1980s likely will depend on population and economic growth. Generally, production will grow 2% or so annually, if imports are limited to the 1% a year annual gain called for in the proposed legislation.

If growth resumes for major volume synthetic fibers at a rate double population growth, production of individual fibers will not top historical volumes until 1990 or later. Even then, in spite of help from new fiber developments, total production might not exceed the 1979 levels.

Textile imports likely will be restricted, but not enough to halt the decline in demand for fibers. Competitive pressures will remain strong, making profitability marginal for many producers. A reduction in capacity to make apparel fibers would result, especially as equipment and processes become technically obsolete.

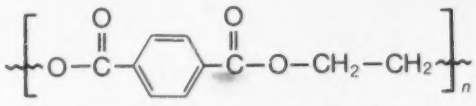
For details of the current year's outlook for the three major synthetic fibers, please see the following pages.

Eastern hemisphere countries account for most growth in synthetic fibers production



Note: Production excludes olefin fibers. a Africa, Asia, and Oceania. **Source:** Textile Economics Bureau

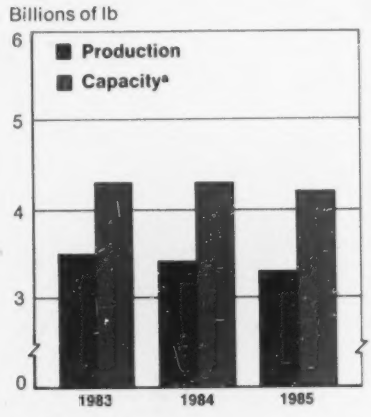
Polyester



Poly(ethylene terephthalate)

- ***Demand slipping***
- ***Capacity easing***
- ***Prices holding***

PRODUCTION/CAPACITY



[a] First quarter.

MAJOR PRODUCERS

Allied, American Hoechst, Celanese, Du Pont, Eastman

HOW MADE

Reaction of dimethyl terephthalate or terephthalic acid with ethylene glycol to make bis(2-hydroxyethyl)-terephthalate, which is polymerized catalytically to poly(ethylene terephthalate)

MAJOR END USES (U.S.)

Apparel 50%, home furnishings 20%, industrial 30%

FOREIGN TRADE

Exports—may total 400 million lb in 1985, imports—to remain less than 75 million lb

PRICES

Round 150-denier yarn about 90 cents per lb; staple about 80 cents per lb

U.S. producers of polyester fibers are meeting with moderate success in coping with the fast-rising tide of imported apparel. They are just keeping production from falling rapidly. For the near-term future, the effects of the textile trade bill, if enacted, will not be felt until next year.

For 1985, fourth-quarter demand for fibers is well set, and another small decline in polyester production seems to be almost certain. For this year, output will total about 3.3 billion lb, down 2.7% from 1984, making it the second year for a slight decline. The 1983 total was 3.55 billion lb, a year of strong recovery following 3.17 billion lb in the recession year of 1982, the lowest yearly production since 1975.

Capacity to make polyester fibers has been holding at about 4.3 billion lb a year. Thus, the average plant operating rate also is falling slowly. This year, for example, that rate will be 76.7%, if 3.3 billion lb of polyester fibers are made.

However, plant capacity to make polyester fibers depends on the size (denier) of the fibers produced. Generally, if a producer makes finer fibers (lower denier), its capacity in terms of weight declines. (Fiber denier is defined as the weight in grams of 9000 meters of filament or yarn.) Shifts in fashion demands for fabrics made partly or wholly of polyester fibers have caused a trend toward lower denier fibers. The mix of fiber products from plants also influences the plant capacity. Estimates of plant capacity for producing textile fibers could be high because of the shift to finer deniers alone.

A few capacity additions at plants making staple and yarn, and making large denier fibers for industrial uses such as tire cord, are offsetting the shift toward finer denier textile fibers. These additions of fiber capacity for industrial uses, however, are at plants where capacities are relatively small when compared with plants that make textile fibers. These additions probably will be so small overall that total capacity will be up only 1 to 2% as 1986 begins, hardly more than the net effect of debottlenecking programs.

If textile trade legislation is passed and is unsuccessful in reducing the growth of imports of apparel made of synthetic fibers, it could cause future reductions in capacity. If imported apparel takes more of the market share away from apparel made domestically with polyester fiber, then operating rates for plants will decline further and capacity will be shut down.

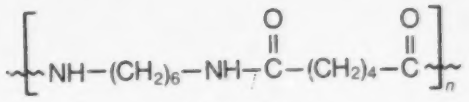
This year U.S. consumption of polyester fibers will be down between 3 and 5%. Increased exports will help to keep production up, but some inventory reduction will offset those exports. Almost all of the decline in demand will occur in apparel uses, which account for about half of U.S. consumption.

Major changes in fashion also have affected consumption of polyester fibers. The slide in demand for 100% polyester fabrics appears to have ended, but at the cost of about a 60% loss in this market. Greater use of blends with wool and cotton to give garments a texture closer to that of all-natural fiber fabrics has cut into use of 100% polyester fabrics.

Other uses of polyester fibers—industrial and home furnishings including automotive upholstery—are, at worst, about level in demand. Most are up slightly.

Polyester-cotton blends have shifted to a 65-35 ratio from 50-50 for bed linens, aiding demand. Cloth interiors of mostly polyester for new automobiles now account for about 90% of auto production, in contrast to about 90% vinyl a few years ago. Tire cord, as the single largest industrial use of polyester fiber, accounts for about a third of consumption. Nonwoven uses of polyester staple, at about 100 million lb in 1984, are a continually growing market and are another important part of this use category.

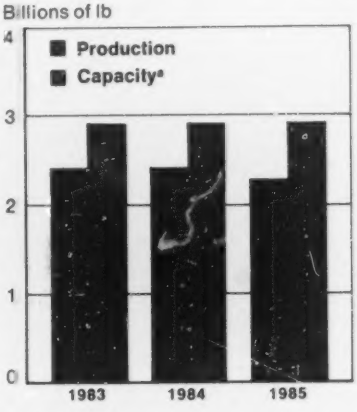
Nylon



Nylon 66

- ***Demand down***
- ***Capacity steady***
- ***Prices holding***

PRODUCTION/CAPACITY



a First quarter.

MAJOR PRODUCERS

Allied, Badische, Du Pont, Monsanto

HOW MADE

Nylon 66—adipic acid and hexamethylene diamine reacted to form hexamethylene diammonium adipate, which is polymerized by removal of water; nylon 6—caprolactam and water reacted to form aminocaproic acid, which is polymerized by removal of water

MAJOR END USES (U.S.)

Home furnishings 60%, apparel 20%, industrial 20%

FOREIGN TRADE

Exports—to hold at about 125 million lb in 1985, imports—remaining under 100 million lb

PRICES

Carpet staple $1.10 to $1.25 per lb; low-denier textile fiber $2.00 per lb

Production of nylon fibers and filaments is expected to slip slightly in 1985, similar to the production declines of other major synthetic fibers. Reasons include some impact from apparel imports, minor reductions of retail apparel inventories, and weaker industrial demand.

Production of nylon fibers in 1985 will total almost 2.3 billion lb, down about 4% from 1984. Production had held at very close to 2.4 billion lb for two years, following the recovery from the recession low of 1.9 billion lb in 1982 (the record high of more than 2.7 billion lb occurred in 1979).

Capacity to make nylon fibers is holding at an annual rate of about 2.9 billion lb, or perhaps a bit more. Changes in fiber size (denier) for nylon to a smaller denier have been minor. Consequently, the reduction in capacity measured as weight of fibers produced is small. Debottlenecking and process efficiency improvements are likely to increase capacity slightly, perhaps 1% or so.

Production in 1985 will amount to 2.3 billion lb, giving an annual operating rate of 79% of nameplate capacity. At this level, little reinvestment capital can be developed.

Both exports and imports have relatively little impact on nylon output and consumption. Exports, expected to be about 125 million lb and made up largely of industrial deniers, have remained in the 100 million to 150 million lb-a-year range for the 1980s. Imports, exclusive of waste fibers, could reach 75 million to 100 million lb this year.

Imports of apparel made with nylon fibers significantly affect consumption of nylon in the U.S., but not so much the demand for acrylic and polyester fibers. This is because apparel accounts for only about 20% of U.S. nylon consumption, well below levels of the other fibers.

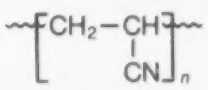
Consumption of nylon fibers in apparel also has been hurt this year by efforts to reduce inventories of women's lingerie at the retail level. Fashion trends toward dresses and away from jeans and slacks continue to bolster the demand for nylon hosiery, but growth in this area is small.

The largest use of nylon fibers—home furnishings, at 60% of total consumption—is showing some growth because of the high level of housing construction. Most of the consumption is in carpets and rugs, which take a bit over 50% of all nylon fiber production. Lower mortgage interest rates are helping both new home sales and sales of used homes. Because new home sales stimulate used home sales (and very frequently carpeting is replaced just after the purchase), forecasts for continued relatively low interest rates bode well for nylon carpet fiber sales.

Despite competition from polyester, polypropylene, acrylic, and other synthetic and natural fibers, nylon fibers have held onto more than 75% of the carpet market for most of the past 10 years. Polypropylene fibers appear to be the strongest competitor in the future because of demand in commercial carpet, but nylon probably will hold its share of the total market for quite some time.

Tire cord is the largest industrial use of nylon fiber. Nylon tire cord goes largely to farm tractor, bus and heavy duty truck, and industrial tires. None of these markets have shown much growth, and tractor and industrial construction nylon tire cord demand has declined recently, as finished tire inventories were reduced. Other industrial uses such as hose and belting reinforcement and cordage are on hold.

Even with some limitations on consumption because of imported finished textile products, the nylon fibers segment of the synthetic fibers industry keeps moving ahead slowly. Growth in demand will continue but not so fast that capacity expansions will be needed this decade. Nylon likely will retain its markets and may even slowly gain market share.

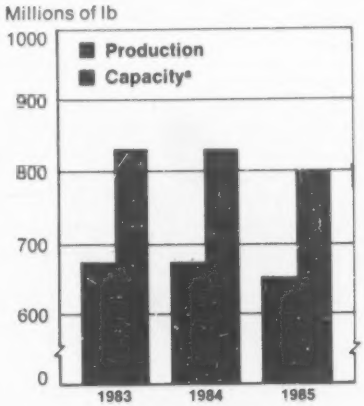


Polyacrylonitrile

Acrylics

- **Demand off a bit**
- **Capacity down**
- **Prices level**

PRODUCTION/CAPACITY



a First quarter.

MAJOR PRODUCERS

American Cyanamid, Badische, Du Pont, Monsanto

HOW MADE

Polymerization of acrylonitrile with small amounts of other acrylate comonomers

MAJOR END USES (U.S.)

Apparel 65%, home furnishings 30%, industrial 5%

FOREIGN TRADE

Exports—expected to total 200 million lb in 1985, imports—to hold at about 25 million lb

PRICES

3-denier staple for apparel 90 cents to $1.10 per lb

Of the synthetic fibers, acrylics have the most problems. Demand declines as imported apparel takes markets from domestic apparel. Competition from acrylic fiber produced in other countries minimizes profitability from exports. And, unless capacity is reduced, plant operating rates will decline, further reducing overall profitability.

Imported apparel has been hurting U.S. acrylic fiber consumption longer and more seriously than it has other fibers, leading to more efforts by producers to develop specialty fibers for U.S. consumption. Despite these efforts, demand for acrylic fibers has trended downward during the 1980s.

Production of acrylic fibers in 1985 likely won't reach 650 million lb. But if it does, it still will be down about 3% from 1984. Production may be lower because the fourth-quarter production slump could be greater than usual.

After holding relatively steady for several years, capacity to make acrylic fibers declined last year to about 800 million lb. This is down substantially from the recent peak of 870 million lb during 1976, 1977, and 1978.

If production totals only 640 million lb in 1985, then the 800 million lb of plant capacity available as the year began will have an average operating rate of 80%. Because exports account for nearly a third of production and are sold at discount prices, profitability at this level of plant operation is meager.

Estimates by the Textile Economics Bureau for future acrylic fiber capacity indicate that it may decline this year and next. The decrease will result more from plant production unit shutdowns than from changes in fiber denier, which has been holding quite constant. The capacity decline may amount to 5 to 7% this year.

Exports of acrylic fibers will total about 200 million lb in 1985, down about 10% from 1984 exports. Exports are forecast by some industry sources to continue to slip, as this often marginally profitable segment of the business is curtailed.

Domestic demand for acrylic fibers will be about the same as last year. The growth in imports of acrylic fiber sweaters apparently has leveled off, with these imports taking about two thirds of the sweater market. Part of U.S. acrylic producers' success in fighting imports stems from development of special variations in acrylic fibers for sweater knitters to make U.S.-produced sweaters that are noticeably different from imports. If legislation is passed to restrict apparel imports, then demand for acrylic sweaters very likely will benefit.

Socks made from acrylic fibers also are facing difficult times from imports, but these imports also seem to have leveled off. Competition from cotton in socks waxes and wanes with cotton production and prices. Fashion and the emphasis on physical fitness, as it affects demand for athletic socks, are offsetting much of the cotton price effect on competition between these two fibers.

After a year or more in the doldrums, demand for acrylic fiber craft yarns picked up this year. However, this use of acrylic fibers likely does not have much longer-term demand growth, with annual consumption forecast to hover around 75 million lb a year.

Other apparel uses of acrylic fibers such as pile fabrics and fleeces (circular knits) are up and down. Fleeces, for both fashion and fitness reasons, continue to grow quite well by standards for commodity fibers. Pile fabrics are down a little in demand as a result of a shift to fiber-filled garments, often with polyester waste as the fill or insulation material.

Carpets, rugs, blankets, curtains, draperies, and other uses are in the home furnishings area of acrylic fibers. None of these uses are changing much and they face continued competition from polyester, nylon, cotton, and wool in the marketplace.